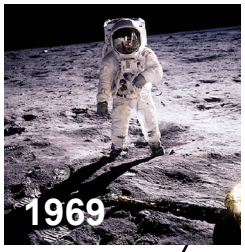
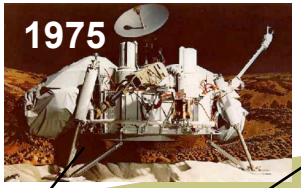
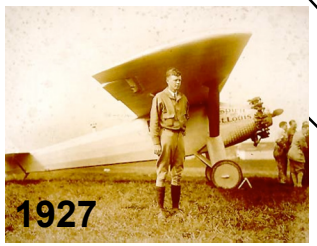
NASA Ames Research Center Overview

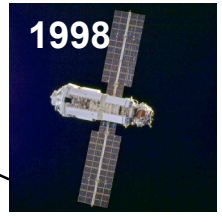
Jack Boyd, Senior Advisor to Center Director
NASA Ames Research Center in Silicon Valley
August 16, 2006 – Presentation to Next Generation Exploration Conference

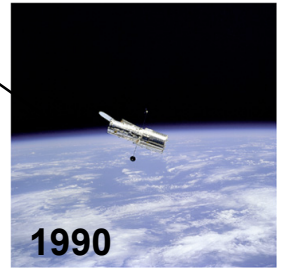
First Century of Flight, 1903–2003

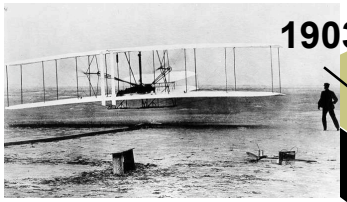


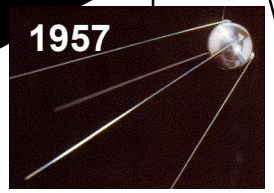


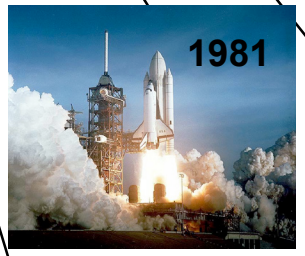


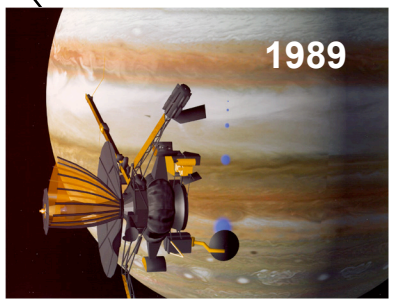


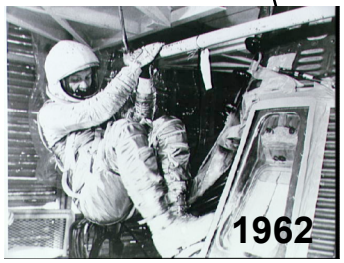


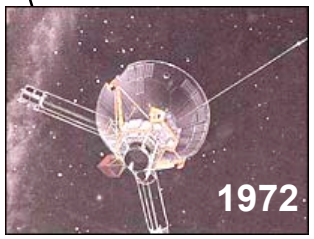












First Century of Flight, Ames Visitors

Charles Lindbergh

Orville Wright

Neil Armstrong

Chuck Yeager

Wernher Von Braun

John Glenn

Jimmy Doolittle

Edward Teller

NACA Research Centers

Joseph S. Ames

NACA

NASA

Ames

Dryden

Langley

Lewis

1915 1939 1940 1946 1958

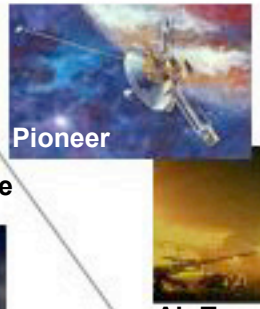
Ames/Moffett Complex

Ames Research Center
in Silicon Valley

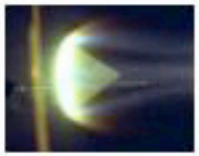
65 Years of Innovation

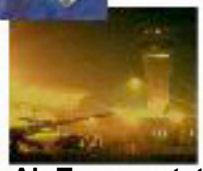

Tektites


Apollo Re-Entry Shape


Pioneer


Blunt body Concept (H. Allen)


Apollo Heat Shield Tests


Air Transportation System

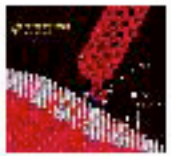

ER-2


Lunar Prospector


NASA Research Park

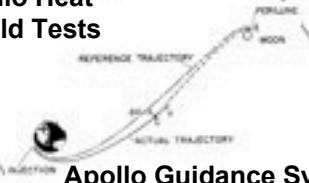

World's fastest operational supercomputer


Galileo

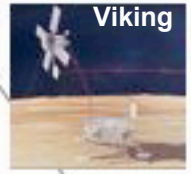

Nanotechnology

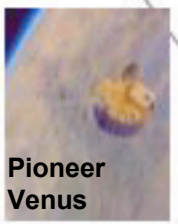
2000

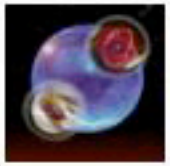

Transonic Flow

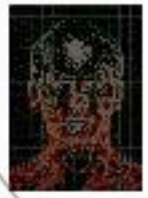

Apollo Guidance System


Tiltrotor

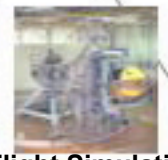

Viking


Pioneer Venus

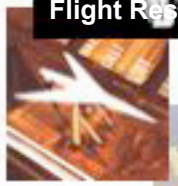

Astrobiology

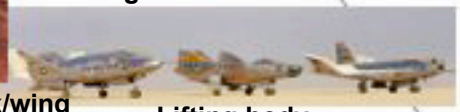

Human Centered Computing


Flight Research


Flight Simulation


Hypervelocity Free Flight


Swept-Back/wing


Lifting body


Computational Fluid Dynamics


Kuiper Observatory


X-36

1990

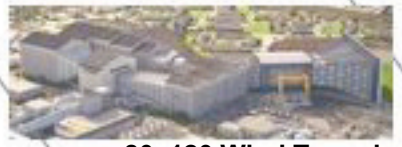

Conical camber


Arcjet Research

1950

1960


Life Sciences Research

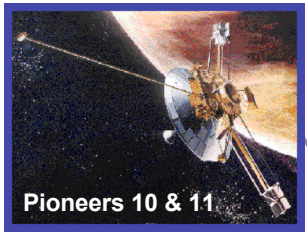

80x120 Wind Tunnel

1970

1980

Ames Projects

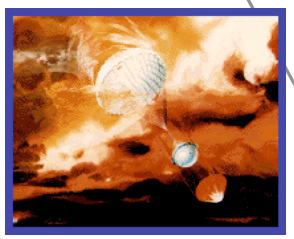
PAET

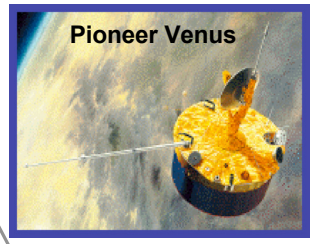


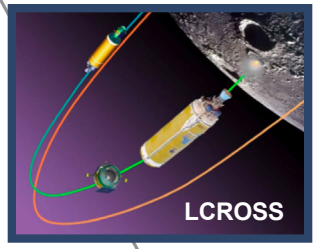
Space Station Biological Research

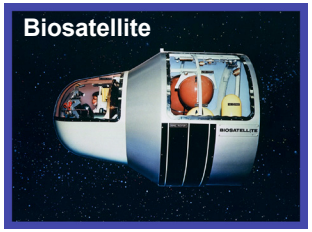
Infrared Astronomy Satellite

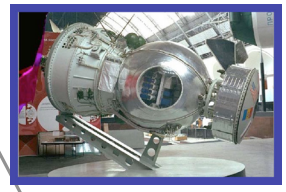
Galileo Probe











Cosmos / Bion

Psychology Systems Experiment

Neurolab

2000

1960

1970

1980

1990

NASA Ames Research Center Today – founded 1939

Science (Earth-Life-Space): Astrobiology- the study of life in the universe

Science Missions

- Stratospheric Observatory For Infrared Astronomy
- Kepler Mission-Search for Habitable Planets

Exploration Systems Development

- Lunar Crater Observation and Sensing Satellite
- Thermal Protection Systems
- Mission Operations
- Integrated Systems Health Management
- Autonomy & Reliable Software

Supporting Technologies

- Information Technology (Autonomy, Human Factors, High-End Computing)

Aviation and Aeronautics

- Air Traffic Management and Control

Education

Innovative Collaborations

- NASA Research Park
- University Affiliated Research Center

2300 Employees

- (1200 Civil Service/1100 Contractor and Other)

$600+ M Annual Budget

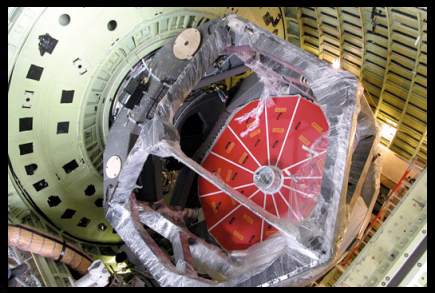
Astrobiology

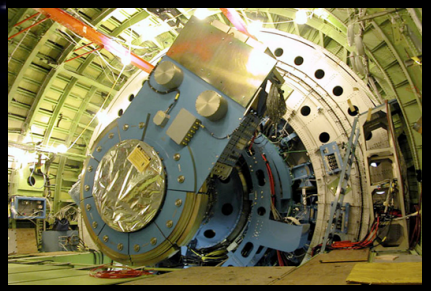
- Scientific study of life in the universe
- Three fundamental questions
  - How does life begin and evolve?
  - Does life exist elsewhere in the universe?
  - What is life's future on Earth and beyond?
- NASA Astrobiology Institute at Ames
  - Dr. Rosalind Grymes, Executive Director
  - Dr. Bruce Runnegar, Science Director
  - 12 lead member institutions

SOFIA

SOFIA will explore the infrared universe flying above interference from the Earth's water vapor atmosphere

National Academy priority from Decadal Surveys, 1991 & 2001





Airborne observatory

2.8 m IR telescope in 747 aircraft

160 flights per year

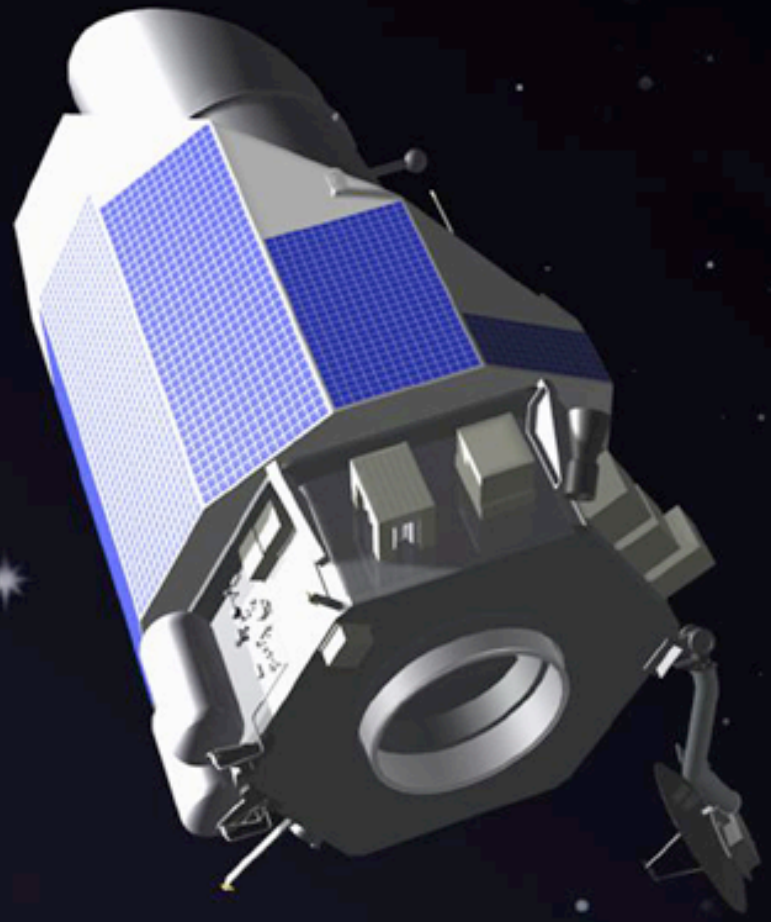
To explore the universe and search for life:

Kepler: The Search for Habitable Planets

Ames led Discovery Mission:
PI- W. Borucki

Critical Design Review:
February, 2006

June 2008 Launch



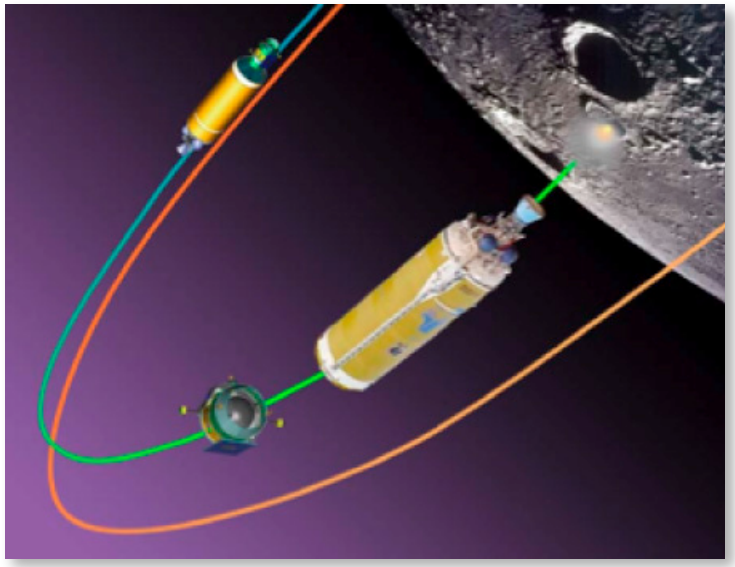
Crew Exploration Vehicle/Crew Launch Vehicle

- **CEV Thermal Protection System Advanced Development Project Office assigned to Ames**
  - Primary roles
    - Maturing ablative material technology
    - Developing TPS ablative material response model
    - Down-selection to a single TPS solution by CEV PDR
    - Supporting aerothermal environments and verification (JSC lead)
    - Project management support, systems engineering support for CEV
  - Mult-center team: ARC, JSC, KSC, LaRC, JPL; Lead: James Reuther
  - Industry to lead detailed design, fabrication, test and verification
- **Mission Operations System for CEV/CLV**
  - ARC is part of the team that will design, develop, and implement the Launch Mission Systems, and Command and Control capability for CEV/CLV
    - Team includes JSC, GSFC, JPL, KSC
- **Integrated Systems Health Management for Exploration**
  - ARC leads the ESMD Technology Development Program's R&D effort in Integrated Systems Health Management for Exploration
    - 5 year research effort focused on CEV, CLV, and RLEP
    - Team includes MSFC, JPL, GRC, and JSC
- **Spacecraft Autonomy for Exploration**
  - ARC is leading the ESMD Technology Development Program's R&D effort in Autonomy for Exploration
    - 5 year research effort focused on CEV, CLV, and RLEP
    - Includes additional work at JSC, LaRC, and JPL

Lunar Crater Observation and Sensing Satellite (LCROSS)

Ames – piggy back on LRO

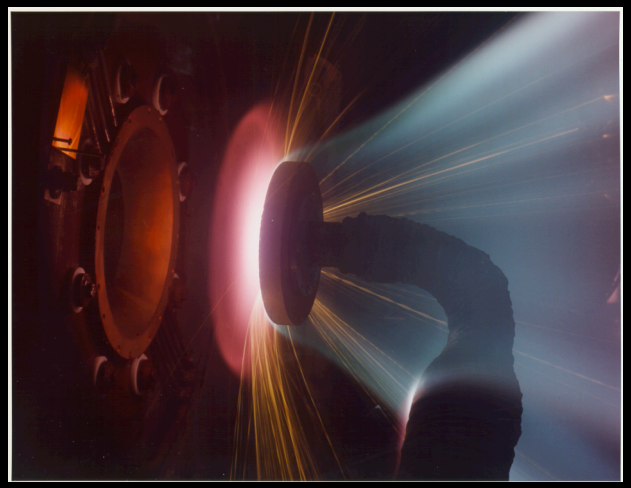
- Lunar Kinetic Impactor Mission employed to reveal the presence and nature of water ice on the Moon's South Pole
  - Delivers a 2000 kg impactor to a lunar crater and measures water signatures with an *in situ* Shepherding Spacecraft that then becomes a 700 kg secondary impactor.
- Mission Objectives
  - Advance the Vision for Space Exploration by confirming the presence or absence of water ice at the Moon's South Pole.
  - Provide technologies and modular, reconfigurable subsystems that can be used to support future RLEP mission architectures.
  - Inspire public interest in NASA's Exploration Vision.



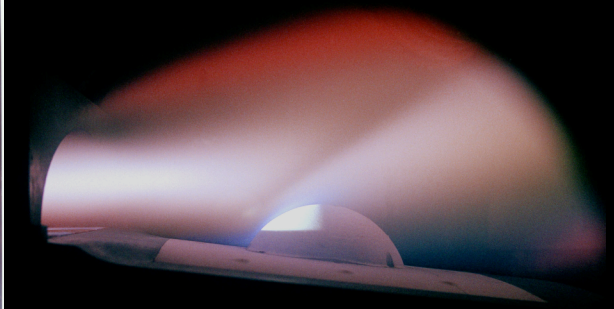
Thermal Protection Materials and Arc-Jet Facility

Testing and/or materials for all US Planetary entry systems; Support for Apollo, Shuttle, and Crew Exploration Vehicle

Ames Arcjet Complex



Ablative Thermal Protection Testing



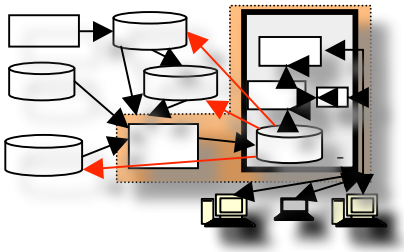
Mars Rover Entry System Test

Human rated vehicle design & test (X-37)

Information Science & Technology

Intelligent Adaptive Systems
Human/machine Interface
Large Data Sets and Datamining

Mars Science Laboratory '09

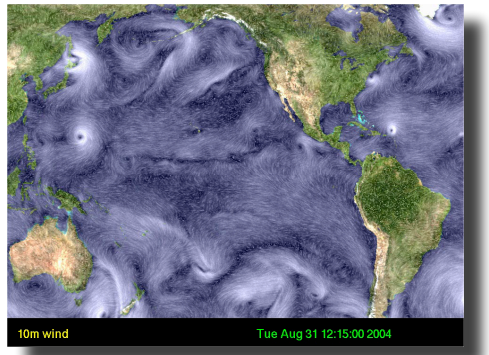


Project Columbia:
One of the world's fastest super computers

Integrated
Systems
Health
Management

Super Computing

Designing the next generations



Global Climate modeling

Project Columbia Integration and Installation

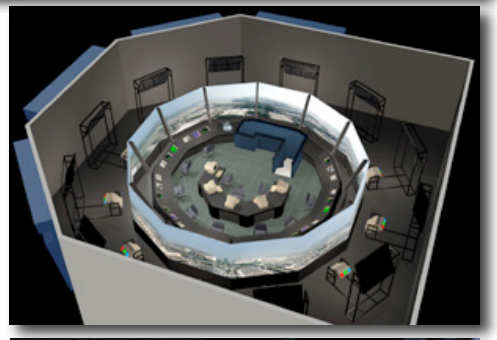
- Provides 61 TFLOPs (10/20/04)
- Conceived, designed, built, and deployed in just 120 days
- Largest SGI system in the world with over 10,000 Intel Itanium 2 processors
- Computation and simulation for Crew Exploration Vehicle, Crew Launch vehicle, Earth Science, Astrophysics, and more

Record Time and Budget!!

Air Traffic Management/Air Traffic Control

Impact: Surface Management System (SMS)

Estimated annual savings of $315M/year to airlines



New Models-UARC

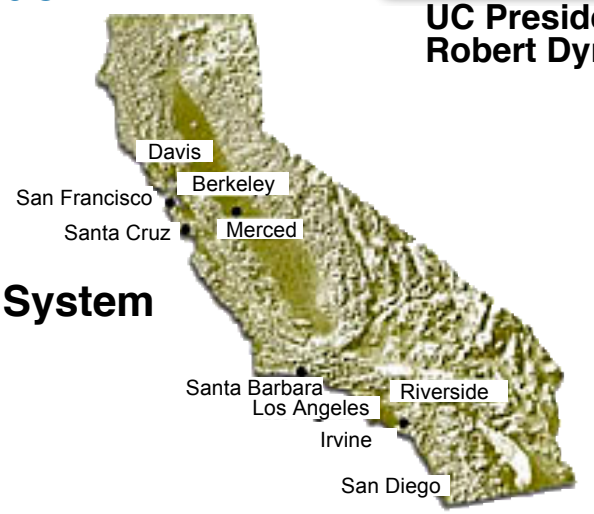
NASA's first University Affiliated Research Center

- 10 year, $330 M contract between NASA Ames and University of California.
- UC Santa Cruz is lead UC institution-Ranked 1st in Space Science by ISI
- Beyond grants and support contracts
- Tasks that are part of NASA's critical milestones
- Flexibility to change tasks as needs arise
- UC: 10 Campuses, 3 National Laboratories
- $18B annual budget
- 4 UC campuses rated among top 15 worldwide

UC President
Robert Dynes

3 Bay Area Campuses

UC System



Next 50 Years – It's Up To You